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Handling Pain in the Coronary Care Unit

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ABBREVIATIONS

CCU= coronary care unit
MI= myocardial infarction
HCM= Hypertrophic cardiomyopathy

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INTRODUCTION

Pain is a common experience that almost all people have suffered in various periods of their life. The person's ability to experience pain is crucial to own survival, since the feeling of pain operates as a sign for the person to be mobilized and protect his/her existence¹. The pain, however, is a very personal experience and is difficult to be defined. As a feeling, it is very subjective. Pain is a learning experience, which is affected by each individual's biome². Pain is a courier symptom which in almost all the acute situations leads the person in a specialized unit as the Coronary Care Unit.

The scope of this presentation is to highlight the importance of prompt response to pain in parallel with the diagnosis and treatment of any imminent disease. But dealing with pain, presupposes the ability of health professionals to recognize the points/symptoms of pain and the capability to approach the patient for proper evaluation. Upon realization of the fact that pain as a patho-procedure affecting the person, can elect but also make difficult its treatment, then it is clear that the management of pain is essential.

1. CONCEPT OF PAIN**1.1. DEFINITION**

According to the International Association for the Study of Pain, pain is defined as the unpleasant sensory and emotional experience, which is linked to actual or threatened damage of tissues or irritation. The definition focuses mainly on the subjective and psychological aspect of pain, regardless of whether this is of organic or psychogenic nature, highlighting at the same time the importance of the individual differences in feeling, adaptation and dealing with the pain².

Hippocrates (Hippocratic collection, 5th – 2nd century b.c) explains that pains are caused by the disturbance of the four “juices” of the human body³ or by the weather conditions. Using the observation, the experience and the logic, pain is separated from the “divine” element. Through the Hippocratic texts, over time and always topical, it is pointed out that the pain and suffering to which the patient is submitted during the treatment must not exceed the pain caused by the disease itself⁴.

1.2. PHYSIOLOGY

Undoubtedly, the knowledge of pain's anatomy and physiology is necessary for the understanding, evaluation and timely intervention of pain's management from the registered nurse. The containers of pain, called algo-receptors, are mainly located in the skin and mucous membranes and are thinner in deeper structures, such as viscera,

walls of arteries and joints. The algo-receptors react to harmful or potentially stimuli, which may be chemical, thermal or mechanical (Fields, 1987). In the chemical ones, histamine, bradykinin, prostaglandin and acids are included, some of which are released by damaged tissues. The anoxic tissue, also releases chemical substances which cause pain. Tissue's edema may cause pain due to compression of algo- receptors. Pain impulses are transmitted to the spinal cord from two types of fibers: The A-Delta fibers that transmit faster the impulses and C fibers that transmit them slower. Thus, the pain described as "acute" or "lancinating" and can easily be identified, is the result of impulses transmitted by A-Delta fibers, while the pain described as "dull" and is more diffused is transmitted by C fibers.

The nervous fibers that transmit pain impulses, are entering the spinal cord. By means of upward routes, having passed by the brain stem, they conclude in the chamber, where they are joined with the third neuron (III). The impulses are transmitted to brain bark through axon of neuron III for interpretation and autonomous and emotional reactions to be activated. Downward dorsal routes, from the chamber, through the mesencephalon and oblong cord, algogenic and deterrent impulses are transmitted. The endogenous downward system of pain suppression is activated more efficiently by algogenics transmitted via A-delta fibers.²

1.3. CLASSIFICATION OF PAIN

Types of pain can be classified based on pain's time duration, pain's pathophysiology, the cause of pain and the area that pain appears. Particular importance for the treatment of pain has its time classification, as well as the one based on pain's pathophysiology as it allows for a better understand-

ing of the mechanisms triggering pain and therefore a better handling². According to its duration, pain is divided into two broad categories: acute and chronic pain.

Acute pain is usually a transitional stage and informs the person that something is wrong. The appearance is usually sudden and in general the painful areas can be well recognized. As subacute, we defined the same pain as the acute but its duration is days to weeks. The pain that persists for more than three months is characterised as chronic. Its cause is either unknown or may not be eliminated. The feeling of pain becomes more widespread, so that it is difficult for the person to recognize the specific point of pain². As a means of separation between acute and chronic pain, Crue (1983) has developed the following pain classification: Acute → Subacute → Relapsed acute pain → Progressive pain → INcurable benign pain → Incurable malignant pain.

1.4. SIGNS & SYMPTOMS

The signs and symptoms of pain can be divided into two groups: a) those which have basically sympathetic origin and b) those which have mainly parasympathetic origin. A basic sympathetic reaction is caused by pain with low or moderate tension or surface pain. Observable signs and symptoms are pallor, increase of blood pressure, respiratory rate, and heart rate, tendency of skeletal muscles and pupil dilation. The body is being prepared to act for overcoming or for avoiding external threat. The secretion of epinephrine is increased and body's defenses are activated. One basic parasympathetic reaction occurs on an intense and deep pain. Observable signs and symptoms are pallor, decrease of blood pressure and heart rate, nausea and vomiting, weakness, fainting, exhaustion, and possible loss of consciousness. The body is trying to minimise

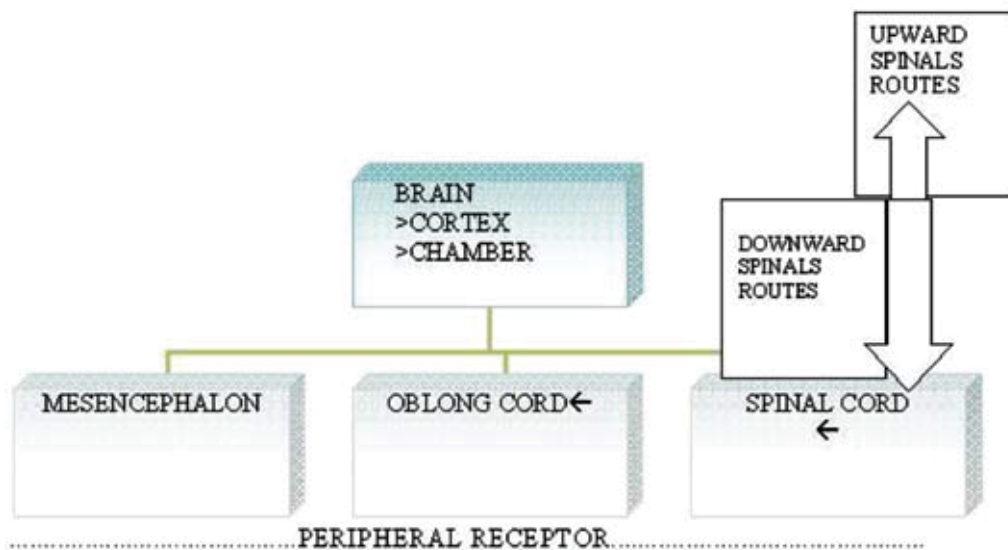


FIGURE 1. Pain transmission pathways.

the results of an internal threat. Body's defenses may be suppressed. Other signs of pain are profuse perspiration, putting pressure on the area of pain in order to reduce the sense of pain, pain grimaces, potential small muscle spasms, quick nictitation. Behaviour signs as subjective are not pain-specific. Consequently, if the observable data imply the presence of pain, subjective data must be obtained from the patient in order to verify the existence of pain².

1.5. THE EXPERIENCE OF PAIN

The pain experienced by each person includes the concept of pain perception and the reaction-response in this perception. The perception of pain is a knowledge-based and evaluative process and consists of a) the stimulation of algo-receptors, b) the change of conveyance, c) cortex's receptivity, d) the interpretation by the brain cortex. The intensity, in which the harmful stimulus is subjectively deemed as painful, is known as pain detection threshold (Filds 1987) and is stable for the same person. In contrast, the tolerance to pain, which is the maximum degree of intensive pain an individual is willing to experience, varies even for the same person in the same situation with only environmental differentiation.

Many factors may increase or reduce the tolerance to pain. Factors which increase the tolerance are alcohol, drugs, hypnosis, heat, strong faith. Factors which reduce it are fatigue, anger, monotony, stress. People react to the pain in different ways, depending on how pain is perceived and what meaning has for them. Factors affecting a person's reaction to pain are the subjective perception of pain, the degree of pain's perception, past experience, cultural values/religious beliefs, age, physical and mental health, framework within which pain appears, the usual reaction in stressful conditions and reactions by health professionals.²

1.6. THE APPROACH OF A PATIENT IN PAIN

When a person complains of pain or requests analgesic, it is very important before any action is taken, to make a quick assessment based on subjective and objective data. It is necessary to collect data on the nature of acute pain, namely location, intensity, time of appearance, duration, frequency, migraine factor, and factors which exacerbate or relieve pain. There are different ways for assessing the intensity of pain. One way is to describe the pain and the difficulty, classifying their intensity in a scale, such as the McGill pain scale: 0= no pain; 1= mild pain; 2= pain causing difficulty; 3= pain causing dysphoria; 4= painful situation; 5= excruciating pain. The classification of pain may also be done via the visual analog pain scale: no pain / painful situation.

The objectives of nursing care include: 1) determination of patient's reaction to pain, 2) assessment of pain as perceived by the patient i.e. location, intensity and type, 3) evaluation of pain with non-described signs by the patient as tachypnea, uneasiness etc, 4) implementation of pain relief actions, 5)

record the time period that was required for the relief of pain, 6) updating the doctor if the pain insists or gets worsened⁵.

2. HANDLING OF PAIN IN THE CARDIAC CARE UNIT

Chest pain is one of the most frequent reasons which lead patients in direct search of health services in the emergency room; 10-20% of these cases have to do with coronary heart disease (Can.Fam.Phys.2007).

2.1. ACUTE CORONARY SYNDROMES

Coronary heart disease includes those clinical situations that have to do with arteriosclerosis of coronary arteries resulting in reduced coronary blood flow. In situations with increased cardiac load, the needs of heart muscle in oxygen are not met. As already mentioned, inadequate oxygenation of the myocardium implies the accumulation of metabolic products (e.g. lactic acid), which arouse the nervous terminations of pain, situated in the myocardium.⁶

2.1.1. Angina

Angina is pain localized behind the middle or the upper third of the sternum (retro-sternal) deep in the thorax. Usually it irradiates into the neck, mandible, shoulders and upper extremities (usually on the left side) and high in the abdomen. It may be perceived as causalgia, tightness, or pressure. The pain can be mild or acute. Angina may also be accompanied by symptoms such as: nausea, vomiting, and "cold sweats". It is accompanied by anxiety and the feeling of imminent death. Usually its duration is 2 to 10 minutes and calms down after absolute rest or administration of nitroglycerin.

There are three types of angina. *Stable angina* occurs in a predictable manner after an activity or stress or exposure to cold. It calms down after absolute rest or the administration of nitroglycerin¹. *Prinzmetal's angina* occurs at rest, is caused by spasm of the coronary vessel usually during the night. *Unstable angina* is crescendo type of angina or angina occurring at rest. The development of angina results in the following problems for the patient: ongoing myocardial ischemia with its attendant serious complications, anxiety in relation to the fear of death, difficulty in relation to CCU's environment and conditions and insufficient knowledge about the nature of the disease and complications.

The objectives of nursing care in the CCU include patient's relief from symptoms and assistance to control the factors causing the anginal attack. The patient, while asked to describe and grade the pain in relation to the preceding maximum pain felt, should be closely monitored regarding the vital signs, ECG and laboratory values (e.g. cardiac enzymes). It is important that the patient is confined to bed in order to reduce myocardium's metabolic needs. The description of

CCU's area, the explanation of the procedure rules in relation to the nature of the disease, constitutes a safe environment for the patient, encouraging at the same time the patient to express the variation in the pain one is feeling.

The feeling that the health professionals are at the patient's bedside is important, as this encourages the patient to express any difficulty, fears and concerns. It should be explained to the patient that the reduction of stress can control the episodes of angina. The pharmaceutical interventions include the initial administration of sublingual and/or intravenous nitroglycerin, usually continued for the next 48 hours intravenously and then orally or through a skin patch². Headache is the most common undesirable effect, which should be treated with analgesics. Concomitant administration of oxygen is helpful, while a most important intervention is the administration of β -adrenergic blockers (initially given intravenously and then orally), which are saving oxygen, thanks to the reduction of heart rate, the reduction of blood pressure and systolic heart function. Ancillary measures include the administration of calcium channel antagonists, in the case of contraindication to β - blockers, as well as the administration of tranquilizers and sedative medications, when needed. Another important contribution of the nursing staff is to prepare the patient for possible cardiac catheterization and percutaneous coronary intervention or even "bypass" surgery if the need emerges for more definitive treatment of the patient's coronary artery problem.

2.1.2. Acute myocardial infarction

Clinically, 65% of cases with acute myocardial infarction (MI), appear with typical angina; chest pain is similar to that of angina in regards to its detection and reflection, albeit more intense, less responsive to medications and of longer duration; it may be accompanied by shortness of breath, diaphoresis, weakness or great fatigue, nausea, vomiting, strong anxiety and concern².

Up to 35% of cases with myocardial infarction present as a non-typical chest pain, which is described as a pinch or a burning sensation and it presents a great diversity in regards to the duration and localization. Pain is not relieved by taking nitrates and changes many times between episodes⁶. There is usually continued distress with patient uncertainty and fear of death. Care givers should continuously assess and monitor the patient with respect to chest pain, vital signs, rhythm disturbances and ECG changes of the ST-T waves, cardiac enzyme values, and level of consciousness and communication.

Treatment at this point may include administration of stronger analgesics, such morphine or pethidine. Morphine is administrated if systolic blood pressure is greater than 100 mmHg and heart rate greater than 50 beats per minute. Expected undesirable reactions to morphine are hypotension and vomiting.³ Before administering morphine, an antiemetic medicine needs to be injected. Administration of oxygen for reducing myocardium's hypoxia is very important. Patient

sedation is necessary in order to minimize heart's load to the lower possible level, freeing the patient from the anxiety, aiming at the reduction of "flow and pressure" load². Of course, restoration of myocardial perfusion via the occluded coronary vessel either pharmacologically with the intravenous administration of thrombolytic medication, or mechanically with primary angioplasty is the more definitive treatment for such patient.

Patient's agony is minimized through talk while the patient is still in the CCU environment, providing information about the nature of the disease and explanation for the interventional techniques such as thrombolysis, coronary angiography etc, that might be implemented. Thus, the patient is assisted to handle pain and manage positively the disease positively. It is worth mentioning that pain due to myocardial infarction may be considerably reduced or absent in aged patients with diabetes mellitus, weakness, reduced intellectual capacity or dyspnea.⁴

2.1.3 Coronary angiography/angioplasty

The definitive diagnosis of coronary heart disease is made through the angiographic study of the coronary arteries⁵. During these interventional procedures, a catheter is inserted, most commonly through percutaneous puncture of the femoral artery, and is engaged into the ostium of the respective coronary artery, under X-ray visualization and guided via injection of contrast dye material². Depending on the findings, coronary angiography may be followed by angioplasty and/or coronary stent placement.¹⁰

After a coronary angiography or angioplasty procedure, the patient may be experiencing pain, which may be localized at the point of femoral puncture in the inguinal area, may still have some residual chest pain either as a consequence of MI evolution or experience stretch pain from the implantation of a stent, or have anxiety related symptoms. Attention should be paid for any recurrence or worsening symptoms which may presage coronary vessel re-occlusion and need for a repeat procedure. Post-procedurally, the point of puncture should be frequently checked and monitored for any bleeding complications. Pain at this point may be related to local ecchymosis or hematoma. Also, the need for complete bed rest and immobilization of patient's respective leg for a defined period for prevention of complications such as local bleeding should be explained to the patient. Frequent dialogue with the patient and updating for what is going to follow, such as removal of the arterial sheath, gradual mobilisation, etc, reduces one's fears and anxiety. Additionally, the dialogue is used for the evaluation of changes in patient's mental state, which if observed may be a sign of serious complications.

2.2 CARDIAC ARRHYTHMIAS

The clinical signs of arrhythmias depend on the underlying structural heart disease and status of left ventricular function,

presence of ischemia, electrolyte or metabolic abnormalities and patient's psychological reaction. Arrhythmias may be accompanied by dizziness and fainting, heart palpitations, shortness of breath, anxiety² and may be followed by loss of consciousness⁶. In this case, pain may be due to insufficient oxygenation of tissues (due to the reduction of cardiac output), further worsened by patient's anxiety.

For the assessment of patient's condition, it is necessary to search for history of cardiovascular and other organic disease and for use of substances. Patient's physical condition must be continuously monitored and his electrical activity continuously recorded. For the treatment of pain, identification and removal of the arrhythmic factor comes first as well as the pharmaceutical or urgent intervention for the correction of arrhythmia, when this is life threatening. Explaining to the patient the necessity of being connected to a monitor-defibrillator, reduces the feeling of restriction and stress that he or she may be experiencing. Also, the presence of health professionals around the patient provides a secure environment and reduces his agony, reducing in parallel the cardiac load. Finally, informing the patient for the necessity of using temporary or permanent pacemaker helps to control the anxiety and encourages the patient to handle the situation positively.

2.2.1. *Temporary transvenous pacing*

Temporary transvenous pacing may last hours, days or weeks. The pain may be localized at the area where the transvenous catheter was inserted, may be related to reduction of patient's comfort, or linked to the anxiety for the course of the disease. The area that the catheter was inserted must be checked regularly for signs of inflammation and be treated according to the current protocol. Pacemaker's function and the derived limitations to patient's activities for safe-guarding the position of electrodes should be explained. In this way, the feeling of difficulty will be minimized for the patient. Finally, by informing the patient on the nature of the disease and the necessity of permanent pacing, the feeling of uncertainty and the anxiety is reduced.

2.2.2. *Implantation of permanent pacemaker/defibrillator*

When cardiac conduction or rhythm disturbances are irreversible or may threaten patient's life in the future, implantation of permanent pacemaker and/or defibrillator may become necessary. This is done upon "recommendation and testimony" in accordance with national or international guidelines. In this case the pain may be localized at the device's site of implantation (subclavian pocket) due to the surgical trauma, or in the chest due to a possible complication of the procedure (pneumothorax, hemothorax or hemopericardium) which need immediate medical attention.

Implantation of permanent pacemaker/defibrillator as being a surgical and interventional procedure entails post-

surgical pain. For this reason analgesic medication should be administrated to the patient for the first days. Also, an aseptic technique should be used for the care of surgical incision and antibiotic medication should be administrated in order to prevent infections². Pain in the area, could imply complications, such as inflammation or abscess. Explaining to the patient the reasons for movement restriction of his upper limb, on the side that the implantation was performed, or the need for staying in bed for the first 24 hours, reduces the feeling of difficulty. By understanding the necessity of device implantation, the patient is relieved from dysphoria; the anxiety is reduced and the patient is helped to maintain positive body image.

2.3 PERICARDITIS

Pericarditis is defined as inflammation of the pericardium. The pericardium is a double-walled sac that contains the heart and the roots of the great vessels. Pericarditis may be dry or it can be characterized by concentration of fluid in the pericardial cavity.¹⁰ The symptoms vary depending on the cause. The pain in pericarditis may be acute, lancinating chest pain that may radiate to the neck, shoulder or abdomen characteristically increased with respiratory movements and the change of body's position.¹⁰ It may be accompanied by fever, sweat, dyspnoea, or arrhythmias. It may be related by patient's stress and anxiety. The diagnosis and treatment of the underlying disease is first priority. Information on the nature of the underlying disease and for the course of treatment helps the patient reduce his/her stress levels. Administration of a medication regimen with analgesics and non-steroidal anti-inflammatory agents (e.g. aspirin, etc) may relieve the pain, while corticosteroids are administrated for more intense symptoms. For the reduction of patient's difficulty, the patient may need to be lying in "Fowler" or "semi-Fowler" position by sitting up and leaning forward and position's effectiveness to reduce the intensity of pain should be assessed. The patient should be encouraged to describe the pain; monitoring for signs of cardiac tamponade with electrocardiography and echocardiography should be done regularly.

2.3.1 *Pericardiostomy*

Pericardiostomy is the appropriate treatment for pericardial effusion when it significantly increases endopericardiacal pressure that compresses the heart, and ideally should be performed in the CCU. In this case, the pain may due to the reduction of cardiac output, localized behind the sternum due to heart's compression or at the point of puncture (usually at the subxiphoid area). Patient's discomfort and associated stress and anxiety may always play a significant role.

2.4. MYOCARDITIS

Myocarditis is the inflammation of the heart muscle. Myocarditis is most often due to infection by common viruses, less commonly non-viral pathogens or as a hypersensitivity

response to drugs¹¹. In myocarditis, the pain may be localized between the ribs and pericardial area, may be due to heart distension and an increase in cardiac load and may coexist with fatigue, nausea, vomiting, dyspnea, fever. Handling of this pain is firstly focused on the treatment of the underlying disease. The patient must be informed about the nature of the disease and must be encouraged to express one's fear in order to reduce agony. It should be noted that anti-inflammatory (salicylic) medications may need to be avoided in the acute phase of the disease because they may increase myocardial damage¹¹. The need for full bed rest should be explained to the patient in order to reduce cardiac load and the discomfort, that patient feels.

2.5. CONGESTIVE HEART FAILURE

Congestive heart failure is a condition in which the heart's function as a pump to deliver oxygen-rich blood to the body is inadequate to meet the body's needs. This is due to cardiac damage and results in reduction of heart's functionality¹⁰.

2.5.1. Left-sided heart failure

This disease is characterized by damage of the left ventricle, which is unable to effectively pump blood to the aorta, resulting in increase of the pressure in the left atrium and pulmonary circulation. In the left-sided heart failure, pain may be due to the reduced pulse volume, poor blood supply to vital organs which also manifests symptoms from the respiratory system, such as dyspnea or breathlessness.

2.5.2. Right-sided heart failure

The damage is in the right ventricle, which is unable to pump blood to the pulmonary artery. The pressure increases in the right atrium and superior and inferior vena cava¹⁰. In the right-sided heart failure, pain may be due to the blood being backed up in body's veins, or to hypoxemia and hypoxia, and may be localized at the right hypochondriac region because of hepatomegaly, while one may note swelling of the feet and ankles.

Management of pain consists of the reduction of cardiac load and the improvement of heart contractility with pharmaceutical means (diuretics, digoxin, vasodilators, etc.) and administration of oxygen. It should be pointed out to the patient that reduction of physical activities is necessary for the reduction of cardiac load and that he/she should not be overwhelmed by the feeling of fatigue. Administration of the suitable sedative medicine for ensuring good sleep, as well as occasional administration of morphine², if allowed by patient's clinical state, reduces the feeling of pain and difficulty. Through the explanation of disease's process to the patient, he/she may be able to control factors that can worsen his/her condition, manage better the disease and reduce the anxiety about the outcome.

2.6. CARDIOMYOPATHIES

2.6.1. Dilated cardiomyopathy

Dilated cardiomyopathy, as defined by the World Health Organisation (WHO-1995), is a clinical syndrome characterized by dilation and reduced contractility of the left ventricle or of both ventricles. All symptoms are similar to the ones of heart failure. Precordial pain, which is often similar to angina, is mentioned by 8-20% of patients in early stages of dilated cardiomyopathy and by 35% of patients in the advanced stages of the disease.⁶

2.6.2. Hypertrophic cardiomyopathy (HCM)

Hypertrophic cardiomyopathy (HCM) is a primary disease of the myocardium and it is characterised by hypertrophy of left and/or right ventricle's myocardium¹². Ventricular walls are much thicker than the physiological and become inflexible. The most common point of hypertrophy is the interventricular septum¹². Through different techniques (thallium scintigraphy, positron emission tomography, etc) it may be shown that HCM results in myocardial ischemia. Thus, angina appears and is mainly due to: a) increased myocardial mass, b) increased parietal stress and increase of oxygen consumption by the myocardium, c) abnormal walls of coronary arteries¹².

2.7. ACUTE PULMONARY EDEMA

Acute pulmonary edema is defined as the presence of excessive fluid in the lungs, in lung interstitium or within the alveoli. It is usually the result of acute left-sided heart failure². Here, pain is due to hypoxemia/ hypoxia, is accompanied by dyspnea, orthopnea, cough with a frothy sputum, perspiration, all expressed with agony and panic. Immediate administration of medication to reduce circulatory blood volume and pressure and to increase the cardiac output of the left ventricle, as well as the administration of oxygen, relieves the patient from the symptoms. Also, morphine is administered in order to reduce patient's pain and distress and consequently reduce cardio-respiratory load². Placing the patient in the "Fowler" position results in the reduction of venous blood returning to heart and reduces patient's feeling of difficulty. Informing the patient of factors that may worsen this condition, as well as for the progress of the disease, reduces his agony.

CONCLUSION

Pain is not only a symptom for warning a person for a health problem. The mechanism of pain increases the cardiac load, increases the needs of myocardium and other tissues in oxygen, thus increasing myocardial ischemia. This results in instability of patient's haemodynamics and probable failure of treatment's implementation. Therefore, the relationship between pain and cardiac disease is interactive: cardiac patient feels pain because of the underlying heart disease, and the

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disease is worsening because of pain.

As health professionals, we must concentrate on patient's comfort and relief. Even within the difficult working conditions of the CCU, which are characterized by reduced personnel and intensive working patterns, the patient in pain should be approached with compassion and care. We should not forget that pain is the usual symptom which leads the patient in search for health services and then to the CCU. The development of a trust relationship between the health professional and the patient is the basis for the expression of pain and fears by the patient. At this point, it should be noted that we must not ignore the objective signs of pain, when pain is not literally expressed by the patient and pain needs to be treated aggressively. Physical examination helps refine the differential diagnosis. While chest pain may be the initial complaint, often the whole body needs to be examined¹³. Delay in treatment can lead to a substantial recidivism of the disease.

The patient should be constantly encouraged to alert the personnel of any complaints of pain. The evaluation of pain through the dialogue and the clinical evaluation individualizes treatment. Administration of analgesics, tranquilizers and sedative medicines contribute to the reduction of patient's agony and stress and help him or her to control factors causing pain. Therefore, the patient is positively participating in his/her course of treatment.

Understanding pain is not a simple sense but a multidimensional experience, opens up new pathways for its study and handling for health care givers. It helps overcome myths and prejudices which continue to prevent the satisfactory treatment of patients in pain. Within the multidisciplinary group, nursing personnel have a unique, important and independent role.¹⁴

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